Slade, E. L., Dwivedi, Y. K., Piercy, N. C., & Williams, M. D. (2015). Modeling Consumers' Adoption Intentions of Remote Mobile Payments in the United Kingdom: Extending UTAUT with Innovativeness, Risk, and Trust. *Psychology and Marketing*, *32*(8), 860-873. https://doi.org/10.1002/mar.20823

Modeling consumers' adoption intentions of remote mobile payments in the UK: Extending UTAUT with innovativeness, risk and trust

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Mobile payments (MPs) are predicted to be one of the future's most successful mobile services but have achieved limited acceptance in developed countries to date. PCs are still the preferred technology for online shopping in the United Kingdom but the continued growth of mobile commerce is highly correlated with the success of remote mobile payments (RMPs). Currently MP research has largely ignored the variations between different MP solutions, and existing MP adoption studies have predominantly utilized Davis' (1989) Technology Acceptance Model, which has been criticized for having a deterministic approach without much consideration for users' individual characteristics. Therefore, this study applied the Unified Theory of Acceptance and Use of Technology (UTAUT), extended with more consumer-related constructs, to explore the factors affecting non-users' intentions to adopt RMP in the UK. Quantitative data was collected (n=268) and structural equation modeling was undertaken. The findings revealed that performance expectancy, social influence, innovativeness, and perceived risk significantly influenced non-users' intentions to adopt RMP, whereas effort expectancy did not. Inclusion of MP knowledge as a moderating variable revealed that there was a significant difference in the effect of trust on behavioral intention for those who knew about MP than for those who did not. These findings have important theoretical and practical implications, particularly for the development and marketing of RMP which will support the long-term success of mobile commerce.

Keywords: Remote mobile payment; UTAUT; innovativeness; risk; trust; moderation

INTRODUCTION

Payment systems and mobile devices and services are essential to the way in which we live in the 21st century. The widespread penetration of mobile devices and their almost constant proximity to the user, together with their storage and transmission capabilities, appear to make them suitable for a variety of payment scenarios and for storing everything that would normally be carried in a physical wallet. Therefore, mobile payments (MPs) may offer the first ubiquitous payment solution, thus delivering a distinctive value to both consumers and merchants (Mallat, 2007). Indeed, the UK Payments Council (2013, p.4) suggests that "in future, the wallet may be obsolete altogether as…our phones will become the hub of our financial transactions". For an increasingly saturated market, MPs also provide mobile network operators (MNOs) the opportunity to develop new business models and revenue opportunities (Chen, 2008). For these reasons, consumer research has matured from the examination of mobile content and commerce (e.g. Ko et al., 2009; Taylor & Lee, 2008) to a more recent focus on MP systems (e.g. Thakur & Srivastava, 2014; Zhou, 2013).

Despite their advantages, as an emerging service, MPs have not yet experienced widespread adoption (Zhou, 2014). With the exception of a handful of countries, the provision of various MP solutions has been much less successful in Europe and North America in comparison with Asian and developing countries (Schierz et al., 2010; UK Payments Council, 2013). In developing countries, where banking infrastructure is usually weak, MP systems such as M-Pesa offer a practical solution for previously unbanked customers (Cellan-Jones, 2012). However, in developed countries there exist a range of alternative payment methods that have a longstanding history against which new MP systems have to compete. Nevertheless, the UK Payments Council (2013) has stated that the UK presents a key growth area in the uptake of MPs and

mobile shopping is growing in the UK at the fastest rate in Europe (Centre for Retail Research, 2014).

To date there has been vague and inconsistent use of the term MP (Au & Kauffman, 2008), although recent studies have started to examine adoption of specific systems, such as Zong MP (Liébana-Cabanillas et al., 2014), Interbank MP Service (Kapoor et al., 2014), and MP using Near Field Communication (NFC) (Leong et al., 2013; Tan et al., 2014). In addition, Ondrus et al. (2009) argue that successful MP business models cannot be directly imported to different cultural contexts, and there is also evidence that the importance of marketing constructs such as trust can differ by cultural context (e.g. Chai & Dibb, 2014). Despite this, to the authors' best knowledge, currently no study has examined adoption of remote MP (RMP) in the UK**.** Successful adoption of RMPs is critical for mobile commerce (MC) (Lu et al., 2011), thus findings from this research will be useful to those with a stake in the survival and growth of both RMP and MC, particularly in the UK. Moreover, as MPs are a competing offering to existing payment systems, those with a vested interest in the survival of credit and debit cards should also take note of this study's findings.

The remainder of the paper is as follows. Firstly, the technological context of MP is identified; then the theoretical context is presented, followed by development of hypotheses to be tested. Next is a section detailing the research methodology employed, and further sections presenting and discussing the results and their theoretical and practical implications. Finally, the paper is concluded, outlining limitations and suggestions for future research.

REMOTE MOBILE PAYMENT

MPs combine payment systems with mobile devices and services to provide users with the ability to initiate, authorize, and complete a financial transaction in which money is transferred over mobile network or wireless communication technologies to the receiver through the use of a mobile device (Chandra et al., 2010; Lu et al., 2011). Under this umbrella term there are two overarching types of MP: proximity MP (PMP) and RMP. Although Slade et al. (2014) explored consumer adoption of PMP in the UK context, there are likely to be significant differences in the factors affecting adoption of the two different types: RMPs use less novel technologies but payer and payee are subject to spatial and temporal separation, whereas newer PMPs tend to require sophisticated technology, which consumers are likely to have much less experience of, such as NFC (Cellan-Jones, 2012).

RMPs arrived as the earliest MP solution, developed initially for scenarios such as digital content services and online purchases, charging users through their mobile phone bill or prepaid airtime (Kim et al., 2010; Mallat et al., 2009; Mallat, 2007). The evolution of network technologies, and of mobile devices from basic phones to smartphones, facilitated RMP 'over the air' via the devices' mobile internet connection to provide similar payment systems for MC as those developed for e-commerce. RMP users generally provide debit or credit card details to the service provider during initial setup of the application, which can usually be stored so that they do not have to repeatedly enter this information (Chandra et al., 2010). The UK Payments Council (2013) attributes the development of online commerce to the mass adoption of payment cards; however, without an integrated RMP solution, MC users may have to input their information the first time they try to 'checkout' their shopping basket on each different MC app, which can be awkward (Pritchard, 2014) and thus a significant deterrent to complete transactions

via MC (Titcomb, 2013). While e-wallet offerings such as PayPal are available for MC, PayPal still only accounts for around 10% of online payments despite being more than 15 years old (Pritchard, 2014).

The introduction of PayM in the UK in April 2014, a peer-to-peer (P2P) RMP system that links a mobile phone number to the owner's bank account, could see the end of P2P cash payments (Jones, 2014). This recent introduction, which the UK Payments Council has been working on for several years (UK Payments Council, 2012), reinforces the relevance of this research. However, PayM is by no means a leading initiative, pipped to the post by Barclays' Pingit app in 2012 which launched as the first P2P RMP app in the UK (Barclays, 2014; Cellan-Jones, 2012). Although initially launched as a P2P app, Barclays later revamped the service to allow their clientele to pay utility bills and to buy goods from billboards and magazine adverts (Skeldon, 2013). As of March 2014, the Pingit app had been downloaded around 2.5 million times and had been used to send over £400 million, with the top two uses being to split food bills and pay friends (Barclays, 2014).

Research by the Centre for Retail Research (2014) revealed that in 2013 £5 billion was spent on online retail via mobile devices in the UK, but this constituted just 12.8% of total online retail sales (£39 billion), the rest being made via PCs (£34 billion). Although mobile shopping is growing in the UK at the fastest rate in Europe, Europe's mobile shopping spend as a whole (£11 billion) is far exceeded by the US, where £23 billion of online retail sales were made via mobile devices in 2013 (Centre for Retail Research, 2014). While MP adoption research has been undertaken in many European countries, such as Germany (Schierz et al., 2010), Finland (Mallat et al., 2009; Mallat, 2007), Spain (Liébana-Cabanillas et al., 2014), as well as the US (Chen, 2008; Shin, 2010), examination of the specific factors affecting UK non-users' intention to use

RMPs, as the country with the fastest growth of MC in Europe but slower than the US, is vital if MC is to continue to try to compete with bricks and mortar offerings and develop as a more substantial arm of e-commerce.

THEORETICAL FOUNDATION

"Consumers of MPs are users of both payment services as well as mobile technology and thus technology considerations usually take a central role in consumer behavior towards MPs" (Thakur & Srivastava, 2014, p.371). A review of the extant literature via *Google Scholar*® and *Scopus*® revealed that more than 50% of MP adoption studies have drawn on Davis' (1989) Technology Acceptance Model (TAM) as a theoretical base (e.g. Chandra et al., 2010; Liébana-Cabanillas et al., 2014; Mallat et al., 2009; Schierz et al., 2010; Shaw, 2014; Shin, 2010; Tan et al., 2014). While TAM has provided a reliable and valid model of user technology adoption, it has been criticized for: supplying very general information on individuals' opinions of novel technologies; having a deterministic approach without much consideration for users' individual characteristics; and assuming that usage is volitional without constraints (Agarwal & Prasad, 1999; McMaster & Wastell, 2005).

Based on criticism of the predictive capacity of TAM, Venkatesh et al. (2003) developed the Unified Theory of Acceptance and Use of Technology (UTAUT) from a thorough review of eight prominent user adoption models. UTAUT hypothesizes that performance expectancy, effort expectancy, and social influence affect behavioral intention, which, together with facilitating conditions, affects use behavior. Moreover, the model posits that the effects of these key constructs on behavioral intention and use behavior are moderated by different combinations of gender, age, experience, and voluntariness of use. The model has been used to examine a wide range of technologies (Williams et al., 2011) and has been used by a handful of quantitative

studies examining the acceptance of MP (Thakur, 2013; Wang & Yi, 2012). Therefore, it was considered theoretically and practically useful to employ UTAUT as the theoretical basis for this research.

Time and resource constraints meant that a focus on non-users of RMP was taken; therefore, it was impossible to measure UTAUT's 'use behavior' and so this construct and, consequently, facilitating conditions were excluded. In common with other IS adoption models, such as TAM, UTAUT was also originally developed to explain employee technology acceptance within an organizational context. In the context of mobile shopping (e.g. Ko et al., 2009) and SMS advertising (e.g. Zhang & Mao, 2008), TAM was extended with constructs that reflect the consumer context, such as trust and enjoyment. Therefore, the extension of UTAUT with constructs that more closely reflect reality of the consumer RMP context in the UK is vital. As consumers tend to consider both incentives and threats in their adoption decision (Cowart et al., 2008), it is important to extend UTAUT to recognize that there are also detractors of innovation adoption. In addition, although much of the UTAUT literature does not explore the role of the original moderating variables (Williams et al., 2011), it was deemed useful to explore the role that existing MP knowledge plays in affecting non-users' adoption intentions.

HYPOTHESES DEVELOPMENT

Performance expectancy in the consumer context is 'the degree to which using a technology will provide benefits to consumers in performing certain activities' (Venkatesh et al., 2012, p.159). In their original model Venkatesh et al. (2003) found performance expectancy to be the strongest predictor of intention, and the effect of performance expectancy on behavioral intention has been supported in the MP context (Thakur, 2013; Wang & Yi, 2012). One of the attractive features of RMPs is the ability to pay for something anywhere, at any time. As RMPs offer a

convenient method of transacting, with no spatial constraints via a device that has become ubiquitous, they offer utilitarian benefits that are likely to be important drivers of adoption. Therefore, it is proposed that:

H1: Performance expectancy positively affects behavioral intention to use RMP

Effort expectancy in the consumer context is 'the degree of ease associated with consumers' use of technology' (Venkatesh et al., 2012, p.159); it is similar to TAM's perceived ease of use. Effort expectancy is one of the most significant predictors of intention to use MP in Wang & Yi's (2012) study, and Thakur (2013) also finds effort expectancy to have a significant effect on behavioral intention. As a similar construct, the direct effect of perceived ease of use on behavioral intention has been both supported (e.g. Kim et al., 2010; Mallat et al., 2009) and refuted (e.g. Chandra et al., 2010; Shaw, 2014) in the MP context, although Chandra et al. (2010) found a substantial indirect effect of perceived ease of use on intention through perceived usefulness. As RMPs use different technologies to existing payment systems, it is likely that the perceived degree of ease associated with using RMP will affect behavioral intention. Based on this and UTAUT's hypotheses, it is anticipated that:

H2: Effort expectancy positively affects behavioral intention to use RMP

Social influence in the consumer context is 'the extent to which consumers perceive that important others believe they should use a particular technology' (Venkatesh et al., 2012, p.159). The underlying assumption is that individuals tend to consult their social network about new technologies and can be influenced by perceived social pressure of important others. In the consumer context, non-users have greater control of their choices and the consequences of these on their social image, so social influence plays a significant role in consumer behavior. Of the

four original UTAUT constructs social influence has been the most tested in the context of MP, and its effect on behavioral intention has acquired more support (e.g. Tan et al., 2014; Yang, 2012; Yang et al., 2012) than opposition (e.g. Shin, 2010; Wang & Yi, 2012). Given the theoretical basis, it is hypothesized that:

H3: Social influence positively affects behavioral intention to use RMP

According to Hirschman (1980), **innovativeness** reflects a person's desire to seek out the new and different. Therefore, the extent to which someone is open to experiencing, and experimenting with, new technologies is an expression of their innovativeness or novelty seeking tendencies. Although innovativeness has not been included in any of the dominant theoretical models of technology acceptance, it has acquired support as a key determinant of new product purchase and innovation adoption across other disciplines (Agarwal & Prasad, 1998; Cowart et al., 2008).

The concept of consumer innovativeness is critical for marketing practitioners (Aroean & Michaelidou, 2014), and thus is an important extension to UTAUT in this context as the original model fails to recognize the importance of individual differences during the adoption process. Although Thakur & Srivastava (2014) found personal innovativeness to affect users' intentions but not non-users' intentions to adopt MP in India, Tan et al. (2014) found innovativeness to be the most significant predictor of behavioral intention to use NFC MP in Malaysia. As RMP systems offer a new payment method that is technologically different to existing payment methods, it is expected that a consumer's innovativeness will play an important role in adoption intention, hence:

H4: Innovativeness positively affects behavioral intention to use RMP

A consumer's perception of **risk** is derived from feelings of uncertainty or anxiety about the behavior and the seriousness or importance of the possible negative outcomes of that behavior (Mandrik and Bao, 2005). Many new products are considered inherently risky. Security and privacy concerns have long been considered problematic for the adoption of e-commerce, particularly among non-adopters (Swinyard & Smith, 2003). Security concerns play an important part of acceptance of online transactions due to the spatial and temporal separation between payer and payee, and vulnerability to security violations resulting from wireless communications infrastructure (Kim et al., 2009; Luo et al., 2010; Shin, 2010). Moreover, the complexity of the MP environment, with various offerings from a number of different uncoordinated providers using different technologies, has left consumers confused, which in turn reduces their confidence in the security of the technology (Gaur & Ondrus, 2012; Jones, 2014).

Perceived risk has been a common extension of UTAUT (Williams et al., 2011); unlike the driving constructs included by UTAUT, perceived risk represents a detractor in the adoption process. In a recent study, Thakur & Srivastava (2014) measured perceived risk as a second order factor consisting of security risk and privacy risk; their findings supported their hypothesis that risk negatively affects adoption intention. However, the effect of perceived risk as a singular construct on adoption intention of MP has been both supported in some studies (Chen, 2008; Liébana-Cabanillas et al., 2014; Lu et al., 2011; Shin, 2010; Yang et al., 2012), and rejected in others (Kapoor et al., 2014; Tan et al., 2014; Wang & Yi, 2012). Therefore, verification of this construct is of particular theoretical use. Given the novelty of the technology as a payment solution and confusing structure of the RMP environment, then it is likely that behavioral intention to adopt RMP will be negatively affected by perceptions of risk. In accordance with Shin (2010), this study focuses on perceived risk of RMP systems, and proposes that:

H5: Risk negatively affects behavioral intention to use RMP

Trust is a subjective belief that a party will fulfil their obligations and it plays an important role in electronic financial transactions, where users are vulnerable to greater risks of uncertainty and a sense of loss of control (Lu et al., 2011; Zhou, 2013). In the increasingly competitive financial services industry, there is an emphasis on trust in an attempt to build solid, long-term relationships with customers (Sekhon et al., 2014). Trust has traditionally been difficult to define and has been treated as both a unitary and multidimensional concept (McKnight et al., 2002). The effect of trust, as a unitary construct, on behavioral intention has gained notable support (Chandra et al., 2010; Lu et al., 2011; Shaw, 2014; Shin, 2010) in the MP context. Moreover, trust has been found to be the most significant predictor of behavioral intention by some of these studies (Chandra et al., 2010; Shin, 2010), superseding the importance of traditional technology adoption factors such as perceived usefulness. Given that the inclusion of trust as a singular, rather than multidimensional, construct has proven successful in this context, then for reasons of parsimony this study extends UTAUT with one construct to measure trust. Akin to Chandra et al. (2010), this study focuses on the effect of trust in RMP systems, which is likely to be critical due to the novelty of the payment solution and convoluted environment. Hence:

H6: Trust positively affects behavioral intention to use RMP

Additionally, trust can also help reduce high perceptions of risk as trust helps users overcome uncertainty or anxiety of the behavior and its possible outcomes (Ganesan, 1994; McKnight et al., 2002). Mallat's (2007) qualitative findings suggest that trust in MP reduces the perceived risks of MPs. Quantitative findings, such as those by Lu et al. (2011), support this proposition, as

they found trust to have a negative effect on perceived risk of MPs. Based on this theoretical guidance, it is hypothesized that:

H7: Trust negatively affects perceived risk of RMP

Pavlou (2003) inferred that trust may act indirectly on intention to transact through the mediating effect of perceived risk, and proposed that future research was needed to further examine the interrelationships between trust, perceived risk, and behavioral intention. Although trust and perceived risk have been found to significantly affect behavioral intention to use MP, and in some of these studies trust has also been found to negatively affect perceptions of risk, the existing studies in this context have not yet specifically examined whether perceived risk plays a mediatory role (e.g. Lu et al., 2011). Gefen (2002) found that trust, and not perceived risk, determined purchase intentions but suggested that as the inherent risk in the product increases, risk becomes more important and trust takes a more secondary role as a reducer of risk. As non-users of RMP are likely to perceive the payment method as highly risky, it is likely that trust will play a more secondary role on behavioral intention than perceived risk, and instead its role will be more important in reducing perceptions of risk. Therefore:

H8: Risk partially mediates the relationship between trust and behavioral intention to use RMP

A lack of **knowledge** has long been considered a potential barrier to adoption of sophisticated technology. Nambisan & Wang (1999) classified three types of 'knowledge barrier': technology-related, project-related, and application-related. However, very few studies have addressed the role of MP knowledge in the adoption process. Kim et al. (2010) tested the effect of knowledge as an antecedent of perceived ease of use of MP. However, their operationalization of this

construct appears to contain items measuring hedonic motivation (e.g. 'I enjoy purchasing products via mobile devices'), usage (e.g. 'I use Internet banking, credit cards, or mobile payment to make purchases'), and self-efficacy (e.g. 'I would be confident to use m-banking for financial transactions').

As there has been a call for the examination of moderating effects on new product purchase and use (e.g. Cowart et al., 2008), this study explores the moderating effect of MP knowledge, adopting an exploratory approach as used by similar studies (e.g. Leong et al., 2013; Tojib & Tsarenko, 2012). It is likely that attributes such as innovativeness, which are related with information seeking and novelty seeking behaviors, are likely to be more influential on adoption intention for those who already have knowledge of MPs than for those who don't. Antecedents such as effort expectancy and perceived risk are likely to play a more notable role in adoption intentions for those who don't already know about MPs. Given the limited research to date, this study attempts to explore the differences in antecedents of adoption intention for non-users who know about MPs compared to non-users who don't. Thus:

H9: Knowledge of MP moderates the antecedents of intention to use RMP

RESEARCH METHODOLOGY

In common with existing quantitative MP adoption research, and as validated scales measuring the defined constructs were already available, a survey methodology was employed. Following a cover letter, the survey comprised two overarching sections. The first section contained the measurement items (see Appendix), which had been selected based on a review of previous studies' scales that were consistent with the definitions of the constructs used in this study. Items were measured using a seven-point Likert scale anchored by "strongly disagree" and "strongly

agree". The second section of the survey contained contextual items asking about respondents' demographic characteristics and their knowledge of MPs. A pilot test of the survey instrument was conducted with 40 UK consumers in order to make wording and layout as clear as possible, to rectify any problems prior to data collection, and to determine the length of time required to complete the questionnaire. Following careful consideration of respondents' feedback, minor changes were made to the information provided about RMP systems and the wording of some questions.

Barclays (2014) state that the oldest user of their MP app, 'Pingit', is 104 years old; given the underrepresentation of older consumers in existing MP studies (e.g. Kapoor et al., 2014; Leong et al., 2013; Zhou, 2013), it was decided to use both paper-print and web-based survey approaches in order to maximize participation (Evans & Mathur, 2005). Because RMP is still an emerging technology in the UK there is no reliable sampling frame from which to conduct probability sampling; instead, a convenience sampling technique was used. The link to the online survey was distributed via social networking tools and through emails to both staff and students of two educational institutions. The paper surveys were distributed through a street-based interception method, with the support of the local council. To meet the needs of the research, respondents had to consider themselves to be British Citizens or permanently reside in the UK and they had to be non-adopters of RMPs. Questions at the start of the survey confirmed eligibility, and the web-based survey was set to automatically terminate if the respondent did not meet the criteria. Those who were eligible and agreed to participate were requested to share the survey with at least three other potential respondents, thus utilizing a snowball sampling technique. Given the length of the survey, the opportunity to enter a monetary lottery was used to

try to enhance response rates without lowering data quality (Deutskens et al., 2004; Sauermann & Roach, 2013).

Structural equation modeling (SEM) was used as a preferable technique to regression as it allows simultaneous analysis of all relationships, combining multiple regression with factor analysis, while also allowing for both observed and latent variables to be analyzed at the same time, and providing overall fit statistics (Mathieu & Taylor, 2006; Tabachnick & Fidell, 2007). Additionally, SEM is able to take into account measurement errors within observed variables (Gefen et al., 2000; Hair et al., 2006). In accordance with the recommendation of a two-stage analytical procedure (Anderson & Gerbing, 1988) confirmatory factor analysis was conducted in AMOS using Maximum Likelihood Estimation, which was then followed by path analysis of the structural relationships. Both mediation and moderation analyses were also undertaken in AMOS.

DATA ANALYSIS

Descriptive analysis

In total, 433 surveys were obtained from British non-users of RMP; however, 165 of these were only partially completed, and as a result were discarded, yielding a test sample of 268 surveys. The sample consisted of a slightly higher proportion of females than males. Unlike many studies in this area the sample also consisted of older consumers, with 33.2% of respondents aged 65+. Over half of respondents were employed either full or part-time (51.5%), and 16.8% classified themselves as full-time students (Table 1).

[Insert Table 1 about here]

Interestingly, 51.5% of respondents stated that they knew they could use their mobile phone to make payments before starting the survey. While 67.5% of respondents stated that they would not buy a specific brand/model of mobile phone in order to use RMP, a much lower percentage (37.7%) said they would not use RMP even if there was a financial incentive to do so over other payment methods.

Measurement model

The overall model fit was assessed in terms of four common measures: normed chi-square (CMIN/DF), Goodness-of-Fit Index (GFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA); for the model to have sufficiently good fit these measures needed to be < 3, $\geq .90$, $\geq .95$, and $\leq .07$, respectively (Hair et al., 2006; Hu & Bentler, 1999). Through analysis of the model fit indices, standardized regression weights, covariance modification indices, and standardized residual covariance estimates, it was decided to remove EE4 and BI1. This significantly improved the model fit indices to create a 'good measurement model' according to Gefen et al.'s (2000) criteria (CMIN/DF 1.566; GFI .914; CFI .989; RMSEA .046).

The measurement model was also verified by examining convergent validity, discriminant validity, and internal consistency (Table 2). The standardized factor loadings ranged from 0.79 to 0.99, which is greater than the 0.5 cut-off required (Gefen et al., 2000). The average variance extracted (AVE) values for each construct were also greater than the 0.5 threshold required (Fornell & Larcker, 1981). Discriminant validity was satisfied as all square roots of the AVE for each factor were greater than the inter-construct correlations (Fornell & Larcker, 1981). Finally, the composite reliabilities were all above 0.90, thus exceeding the recommended cut-off of 0.70 (Nunnally & Bernstein, 1994) and demonstrating internal consistency.

[Insert Table 2 about here]

Structural model

Model fit of the structural model was also good (CMIN/DF 1.753; GFI .902; CFI .985; RMSEA .053). Path analysis revealed that five of the seven structural hypotheses acquired support (Table 3 and Figure 1). Significant positive relationships were observed between performance expectancy and behavioral intention (confirming H1), social influence and behavioral intention (confirming H3), and innovativeness and behavioral intention (confirming H4). Significant negative relationships were observed between perceived risk and behavioral intention (confirming H5) and trust and perceived risk (confirming H7). However, no significant relationships were observed between effort expectancy and behavioral intention (rejecting H2) nor trust and behavioral intention (rejecting H6). The four significant constructs explained 67% of variance in behavioral intention. Although the direct effect of trust on behavioral intention was found to be insignificant, it had a great negative influence on perceived risk, explaining 54% of variance.

[Insert Table 3 about here]

[Insert Figure 1 about here]

Given the non-significance of the direct effect of trust on behavioral intention, H8 is rejected. In order to examine any indirect effect bootstrapping was used according to Cheung & Lau (2008). Number of bootstrap samples was set to 1000 with a bias-corrected confidence level of 95. As shown in table 4, the direct effect of trust on behavioral intention is not significant both when the relationship between trust and perceived risk is included and excluded. However, the indirect effect of trust on behavioral intention is significant. Therefore, according to Mathieu & Taylor

(2006) it can be concluded that trust has an indirect effect on behavioral intention via perceived risk, but risk does not play a mediatory role.

[Insert Table 4 about here]

In order to examine the moderation effect of MP knowledge, the data was divided into two groups: 138 respondents who knew about MP and 130 who did not. The chi-square difference test was used (Table 5), as per previous MP studies (e.g. Thakur & Srivastava, 2014). Measurement invariance was established following the release of constraints on items TRU4 and SI2; as the addition of structural residual constraints did not lead to significant differences, invariance related to the structural relationships could be examined (Baron & Kenny, 1986; Williams et al., 2003). The addition of constraints on structural paths did lead to significant differences ($p < .050$), thus supporting a moderating effect of MP knowledge. Individual path analysis (Steenkamp & Baumgartner, 1998) found the effect of trust on behavioral intention to be significantly different for the two groups ($p = .040$); the effect of effort expectancy on behavioral intention narrowly missed significance ($p = .065$). All other structural relationships remain non-affected by moderation. Examination of the unconstrained regression weights (Table 6) revealed that trust is significant for those with knowledge of MP, but not for those who did not know about MP. For knowledgeable non-users, the factors explain 64% of variance in behavioral intention, whereas explained variance in behavioral intention for those without existing knowledge is significantly higher at 74%.

[Insert Table 5 about here]

[Insert Table 6 about here]

DISCUSSION AND IMPLICATIONS

This study employed and extended UTAUT to examine non-users' adoption of RMP in the UK. Although the descriptive statistics revealed that half of respondents were already aware that they could make payments using their mobile devices, all of these respondents were currently non-users of RMP. This suggests that RMP systems are not currently satisfying the needs of UK consumers; hence developers' and marketers' application of this study's findings in practice is imperative to improve adoption.

This research has provided further support for some of UTAUT's constructs in a modern consumer context. The effects of innovativeness and perceived risk were also found to play an important role in affecting non-adopters' behavioral intentions to use RMP, although the two significant UTAUT constructs still exhibited the greatest influence on behavioral intention. Gaining significant results of additional constructs such as risk and innovativeness reiterates the importance of tailoring technology adoption models originally developed for the organizational context to the consumer context. While Venkatesh et al.'s (2003) model explained just 30% of variance in behavioral intention when the interaction terms were not included, the extended model in this study explained 67% of variance in behavioral intention to adopt RMP.

Concurrent with existing MP adoption research (Thakur, 2013; Wang & Yi, 2012), the role of performance expectancy was supported in the RMP context, suggesting that utilitarian benefits of RMP are important to potential users. While in their original model Venkatesh et al. (2003) found performance expectancy to be the strongest predictor of intention, in this study performance expectancy came second in importance to social influence, suggesting that in the consumer context non-users are influenced more by social pressures than the usefulness of the technology itself. Nevertheless, given that performance expectancy significantly predicted

behavioral intention then developers need to ensure that RMP systems offer utilitarian benefits that cannot be matched by existing payment systems, hence offering a distinct value. This is unlikely to occur in the currently fragmented RMP environment in the UK. Integrating different offerings so that users do not have to continuously download different apps is essential. PayM has gone some way to achieve cohesion in the industry (UK Payments Council, 2014); however, this is only in the P2P context. For the survival of MC, apps such as PayM need to be developed further so that they can be integrated as a MC payment method. In addition, developers should look to integrate PMPs with RMP apps to realize the truly ubiquitous potential of this payment system and the resulting utilitarian benefits.

It was anticipated that the degree of ease associated with consumers' use of RMP would positively affect behavioral intention. The lack of support for this hypothesis is likely to be related to the ubiquity of mobile phone technology. Chong (2013) found perceived ease of use to have an insignificant effect on intention to use MC, which was suggested to be down to familiarity with devices. This can explain why the effect of effort expectancy on behavioral intention plays a more important role for non-users who do not have knowledge, and are hence unfamiliar, with MP; those who already know about MP are likely to be familiar with the operation of RMP. Given these findings, allocation of resources to focus marketing communications on the ease of using RMP without segmentation of the target audience would be wasteful.

While Yang et al. (2012) found the effect of social influence on behavioral intention to be stronger for current users than for non-users of MP, the findings from this study reveal social influence as the strongest predictor of non-adopters' behavioral intention to use RMP in the UK context. Marketers can utilize the importance of social pressures to their advantage by offering

those who have adopted the technology incentives or rewards to recruit non-users. Marketing activities should focus on targeting entire social networks, perhaps insinuating that those not using P2P RMP are 'uncool' in the context of their social circles to encourage non-users' adoption. Moreover, RMP providers might enhance their use of social media to promote interpersonal word-of-mouth communications.

Innovators are a valuable resource to firms introducing new products (Ruvio & Shoham, 2007). Innovativeness was found to positively affect behavioral intention to adopt RMP, suggesting that individual characteristics typically excluded from existing theoretical models of technology acceptance are actually important considerations in this context. This finding contradicts Thakur & Srivastava (2014) who found innovativeness to only affect users' intentions, although moderation analysis did reveal that innovativeness had a slightly stronger influence for those with knowledge of MPs than those without. Harnessing this finding, marketing practitioners should reinforce the new experiences that RMPs offer. Focus could be placed on P2P payment scenarios where people are often left in difficult situations trying to split bills with cash or card, such as at a restaurant, to emphasize the new experience of using an RMP system such as PayM, which would also allow the user to show-off their innovativeness to others in their company.

This research supported findings of both risk and trust as unitary constructs on behavioral intention. As marketing literature has long recognized both perceived risk and trust as important factors that influence consumer behavior (e.g. Chang and Wu, 2012; Peter and Tarpey, 1975), this finding is of particular theoretical importance for future researchers. The support for perceived risk's influence on behavioral intention to adopt RMP is concurrent with several MP adoption studies (e.g. Liébana-Cabanillas et al., 2014; Yang et al., 2012; Lu et al., 2011; Shin, 2010; Chen, 2008). This finding authenticates theoretical extension of technology acceptance

models applied to the consumer context with risk constructs, reflecting the difference between on whom the risk falls in the organizational, compared with the consumer, context. Despite the utilitarian advantages of RMP, the nature of having a ubiquitous device with everything stored in one place poses obvious risks. Developers should utilize sophisticated schemes of authentication as advised by Shin (2010), advanced encryption technologies, and third-party certification, which marketers should then communicate to potential users to reduce security concerns about RMP systems.

Gefen (2002) advised that more research was required to examine how the roles of trust and risk change when the inherent risk in the product increases. Unlike Lu et al. (2011) who found the effect of trust to have a much stronger effect on behavioral intention than that of perceived risk, this study found no direct effect between trust and behavioral intention for the sample as a whole. This suggests that perceived risk is the dominant factor out of perceived risk and trust in the pre-adoption stage of RMP. However, in accordance with Lu et al. (2011) trust was found to have a significant negative effect on perceived risk. Through this relationship, trust was also found to have an indirect effect on behavioral intention to adopt RMP. Many of the stimuli that increase trust in RMP systems are the same stimuli that reduce perceived risk of these systems; hence this finding reiterates the importance of utilizing advanced security measures and disclosing security and privacy assurances. Moreover, satisfaction guarantee policies are also trust-building measures that may help to reduce perceptions of risk (Lu et al., 2011).

Finally, this study found pioneering evidence that knowledge of MP moderates the effects of antecedents of behavioral intention, and supports the segmentation of consumers further than into just user and non-user groups (Swinyard & Smith, 2003). All relationships were found to have different levels of importance. For those who knew about MPs, the effect of trust on

behavioral intention not only became significant but also had the largest effect, whereas for those with no knowledge of MP performance expectancy was the strongest predictor of intention and the direct effect of trust was not significant. These findings suggest that knowledge allows a non-user to weigh up the trustworthiness of RMPs. However, this knowledge appeared to also make non-users slightly more concerned about potential risks of using the technology. Despite this, non-users with existing knowledge were still highly motivated by performance expectancy as this was the second most influential antecedent of intention, thus reiterating the importance of promoting utilitarian benefits of the technology across consumer segments. As the antecedents explained a much greater proportion of variance in behavioral intention for those without knowledge of MP, it can be concluded that other factors not examined are important for knowledgeable non-users, which should be explored in future research.

CONCLUSION

This study adds valuable empirical findings to the current MP literature through creation of a more consumer-centered model to identify the factors affecting non-users' intentions to use a specific type of MP in a country which has not yet been examined; a country which is leading the way in Europe's adoption of MPs but where adoption still remains in the early stages. By gaining a better understanding of the factors affecting UK non-users' intentions to adopt RMP modifications can be made to both the design and marketing of the technology so as to increase uptake, which should also support the continued acceptance of MC.

The findings of this research provide a number of theoretical and practical contributions. Firstly, referring to theoretical contributions, the findings reinforce the need to tailor technology adoption models to the consumer context in order to recognize individual differences and adoption threats. In terms of UTAUT's original constructs, support was acquired for the central

role of performance expectancy, although in the consumer context this is not always the most important antecedent of behavioral intention, which contrasts to Venkatesh et al.'s (2003) original findings in the organizational context. In addition, the findings supported the inclusion of trust and risk as unitary constructs, providing greater parsimony, which will help to minimize the time respondents need to spend answering questions in future studies. Considering the practical contributions of the study's findings, developers should continue to improve utilitarian benefits and security measures, and marketers should focus on promoting these. However, non-users should not be treated as a homogenous group by marketers as those with existing knowledge are more influenced by trust in RMP systems whereas those without existing knowledge are more affected by the utilitarian benefits that RMPs offer. Finally, marketers should focus on segmenting their communications to firstly target more innovative consumers, and then their social networks.

Limitations and future research

Despite its contributions this study is not without limitations, and these limitations provide fruitful avenues for further research. As anticipating consumer behavior accurately is notoriously difficult, it is recommended that future research takes a longitudinal approach, which would enable the examination of the effect of behavioral intention on use behavior, and hence the inclusion of the relationship between facilitating conditions and use behavior. Longitudinal research would also allow the examination of change in the importance of constructs over time, particularly to see if the effect of trust on behavioral intention over time becomes significant across the board. Further research not constrained by time or resources would also be able to explore the increasing significance of effort expectancy for non-users without existing knowledge of MP. The inclusion of personal characteristics in technology acceptance models has

largely been ignored due to the original developments being for the organizational context. Hence, it would be useful to further explore the relationship of innovativeness on the importance of other significant constructs such as performance expectancy, social influence, and risk. Given that the descriptive findings revealed that non-users may be influenced to use RMP by financial incentives, then future research should explore the types of financial incentive that will entice non-users to use RMP over other payment methods. Finally, cross-cultural comparisons of the validity of this model with both developed and developing countries would be theoretically and practically useful.

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Special thanks to Professor Rajan Nataraajan and the blind reviewers for their constructive comments which helped to strengthen this manuscript.

Table 1. Characteristics of respondents

Demographic	Group	Frequency	Percentage
Age	18-24	44	16.4
	25-34	36	13.4
	35-44	24	9.0
	45-54	27	10.1
	55-64	48	17.9
	65+	89	33.2
Gender	Male	117	43.7
	Female	151	56.3
Employment status	Employed full-time	88	32.8
	Employed part-time	50	18.7
	Self-employed	5	1.9
	Full-time student	45	16.8
	Retired	75	28.0
	Unemployed	5	1.9

Table 2. Validity measures

Construct	CR	AVE	Discriminant validity						
			IV	**PE**	**EE**	**SI**	**BI**	**PR**	**TRU**
IV	0.910	0.772	*0.879*						
PE	0.949	0.861	0.548	*0.928*					
EE	0.955	0.877	0.697	0.705	*0.936*				
SI	0.989	0.967	-0.018	0.405	0.123	*0.983*			
BI	0.975	0.952	0.532	0.717	0.577	0.538	*0.976*		
PR	0.972	0.920	-0.522	-0.520	-0.479	-0.214	-0.600	*0.959*	
TRU	0.975	0.907	0.500	0.469	0.482	0.061	0.477	-0.729	*0.952*

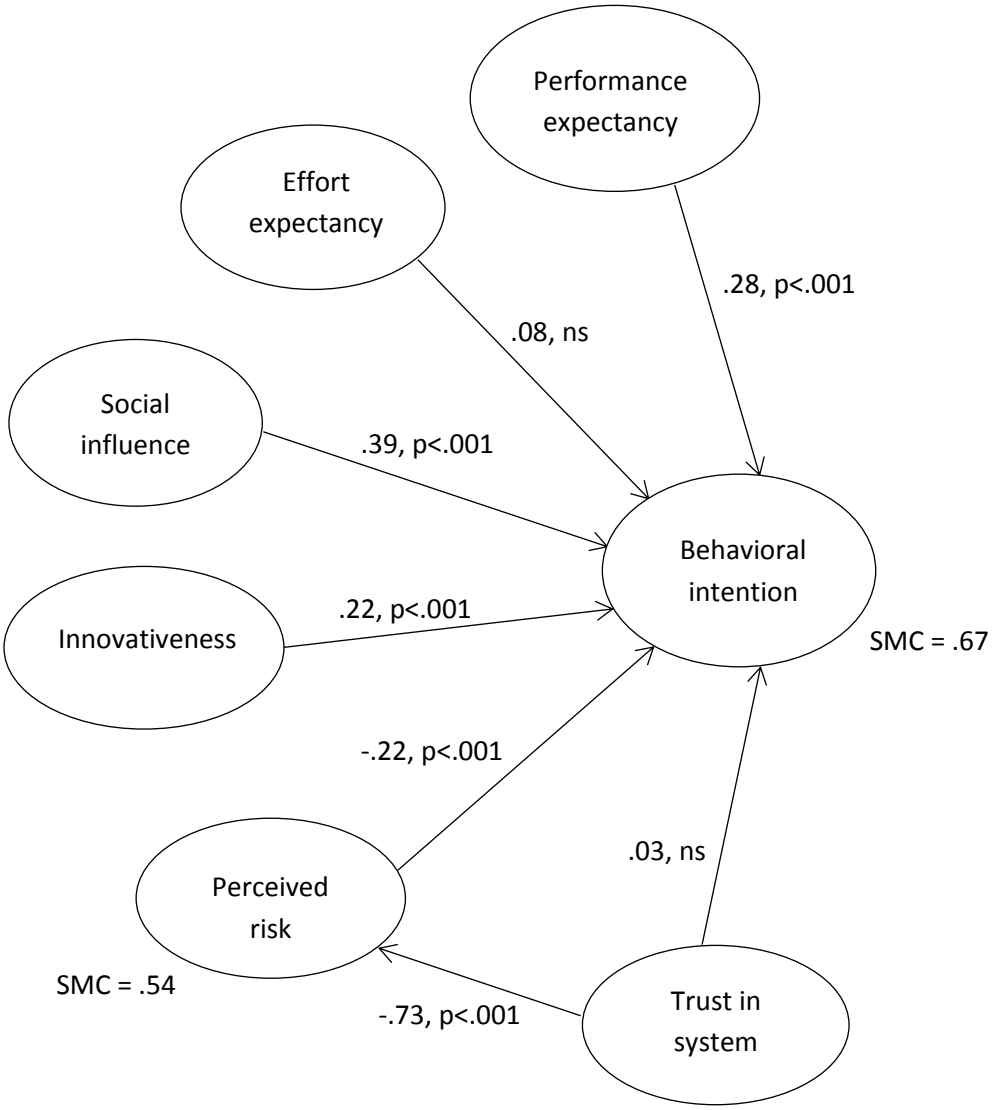
Note: CR = composite reliability; AVE = average variance extracted; IV = innovativeness; PE = performance expectancy; EE = effort expectancy; SI = social influence; BI = behavioral intention; PR = perceived risk; TRU = trust; square root of AVE is shown in italics at diagonal.

Table 3. Summary of results of structural relationships

Hypothesis	Structural path	Proposed effect	Estimates			Result
			SRW	*t*-value	p-value	
H1	PE → BI	+	.281	4.298	.000	Supported
H2	EE → BI	+	.080	1.209	.227	Rejected
H3	SI → BI	+	.387	8.790	.000	Supported
H4	IV → BI	+	.218	3.700	.000	Supported
H5	PR → BI	-	-.220	-3.951	.000	Supported
H6	Tru → BI	+	.028	.458	.647	Rejected
H7	Tru → PR	-	-.732	-14.757	.000	Supported

Note: SRW = standardized regression weight; PE = performance expectancy; EE = effort expectancy; SI = social influence; IV = innovativeness; PR = perceived risk; TRU = trust; BI = behavioral intention.

Figure 1. Structural model results



Note: path values = standardized regression weights; ns = p > .05; SMC = squared multiple correlation.

Table 4. Indirect effect analysis

Relationship	**Standardized direct effect without mediation**	**Standardized direct effect with mediation**	**Standardized indirect effect**
Trust on behavioral intention	.039 (p= .522*)	.028 (p= .686*)	.161 (p= .002*)

Note: * = two-tailed significance.

Table 5. Invariance tests

Model	χ^2	df	χ^2/df	CFI	RMSEA	Nested model	$\Delta\chi^2$	Δdf	p-value
1. Unconstrained	557.413	340	1.639	.977	.049				
2. Measurement weights constrained	590.265	354	1.667	.975	.050	2-1	32.852	14	0.003
2a. Measurement weights constrained except TRU4	582.270	353	1.649	.976	.049	2a-1	24.857	13	0.024
2b. Measurement weights constrained except TRU4 and SI2	577.256	352	1.640	.976	.049	2b-1	19.843	12	0.070
3. Measurement weights (2b) and structural residuals constrained	583.038	354	1.647	.976	.049	3-2b	5.782	2	0.056
4. Measurement weights (2b), structural residuals, and structural paths constrained	603.246	361	1.671	.974	.050	4-3	20.208	7	0.005
4a. PE-BI	583.618	355	1.644	.976	.049	4a-3	0.58	1	0.446
4b. EE-BI	586.446	355	1.652	.975	.050	4b-3	3.408	1	0.065
4c. SI-BI	583.275	355	1.643	.976	.049	4c-3	0.237	1	0.626
4d. IV-BI	583.129	355	1.643	.976	.049	4d-3	0.091	1	0.763
4e. PR-BI	583.047	355	1.642	.976	.049	4e-3	0.009	1	0.924
4f. TRU-BI	587.273	355	1.654	.975	.050	4f-3	4.235	1	0.040
4g. TRU-PR	584.704	355	1.647	.975	.049	4g-3	1.666	1	0.197

Note: df = degrees of freedom; PE = performance expectancy; EE = effort expectancy; SI = social influence; IV = innovativeness; PR = perceived risk; TRU = trust; BI = behavioral intention.

Table 6. Comparison of structural relationships for the two groups

Structural path	Knowledge				No knowledge			
	SRW	***t*-value**	**p-value**	**SMC**	**SRW**	***t*-value**	**p-value**	**SMC**
PE → BI	.231	2.687	.007	.643	.271	2.404	.016	.740
EE → BI	-.047	-.596	.551		.227	1.848	.065	
SI → BI	.225	3.379	.000		.265	4.735	.000	
IV → BI	.230	3.099	.002		.210	2.474	.013	
PR → BI	-.202	-2.300	.021		-.151	-2.305	.021	
Tru → BI	.247	2.467	.014		-.003	-.047	.963	
Tru → PR	-.731	-8.887	.000	.545	-.721	-11.609	.000	.520

Note: SRW = standardized regression weight; SMC = squared multiple correlation.

APPENDIX

Construct	Measurement	Source
Performance expectancy	I would find RMP useful in my daily life; Using RMP would help me accomplish things more quickly; Using RMP might increase my productivity.	Venkatesh et al., 2012
Effort expectancy	Learning how to use RMP would be easy for me; My interaction with RMP would be clear and understandable; I would find RMP easy to use; It would be easy for me to become skillful at using RMP.*	Venkatesh et al., 2012
Social influence	People who are important to me think that I should use RMP; People who influence my behavior think that I should use RMP; People whose opinions I value prefer that I use RMP.	Venkatesh et al., 2012
Innovativeness	If I heard about a new technology, I would look for ways to experiment with it; Among my peers, I am usually the first to explore new technologies; I like to experiment with new technologies.	Thakur & Srivastava, 2014; Yang et al., 2012
Perceived risk	I do not feel totally safe providing personal private information over RMP systems; I'm worried about using RMP systems because other people may be able to access my account; I do not feel secure sending sensitive information across RMP systems.	Lu et al., 2011
Trust	I trust RMP systems to be reliable; I trust RMP systems to be secure; I believe RMP systems are trustworthy; I trust RMP systems.	Chandra et al., 2010
Behavioral intention	I intend to use RMP in the future;* I will always try to use RMP in my daily life; I plan to use RMP frequently.	Venkatesh et al., 2012

Note: * = item dropped